

IN THE CLAIMS:

Please cancel claims 1-7 and 19 without prejudice or disclaimer, and amend claims 8-9, 16-18 and 20, and add new claims 21-27 as follows:

1-7. (Cancelled)

8. (Currently Amended) An access router comprising:

a plurality of communication I/Fs to connect to external communication lines;
a processor which executes predetermined processing on packets transmitted and received through a user terminal and utilizes an interface table corresponding relationships to support each of a plurality of virtual routers accommodated therein to perform routing actions independently from other virtual routers; and

a memory which stores reference information used to execute predetermined packet processing actions on received packets;

wherein the memory stores the corresponding relationships each defining among a physical interface identifier for identifying a physical interface, a logical interface identifier for identifying a logical interface, a kind of protocol of a received packet, a first virtual router identifier for identifying a first virtual router, a first packet processing action to be executed on the received packet by the first virtual router, a second virtual router identifier for identifying the second virtual router designated to exclusively execute a second packet processing action which is different from first packet processing action, ~~the interface table holding, for each of interfaces, a relation among a physical interface identifier and at least one logical interface identifier of the received packet, an identifier representing a protocol supported by the logical interface, information specifying a packet processing action to be executed based upon the protocol, and a virtual router identifier, and a plurality of said logical interfaces are multiplexed to handle a plurality of protocols on the communication I/Fs respectively so as to transmit and receive packets to and from user terminals according to a respective protocol and per packet processing action;~~ and

~~a routing information table holding~~ routing information to be processed by virtual routers corresponding to the virtual router identifiers, respectively;

wherein the processor refers to the interface table corresponding relationships and identifies an identifier of [[a]] the first virtual router that corresponds to a respective L2TP tunnel to process the received packets, and reads from the routing

~~information table~~ routing information managed by the first virtual router ~~corresponding to the virtual router identifier~~ and forwards the received packets from an receiving logical interface to another interface associated with a ~~respective~~ the second virtual router, and the processor processes a received packet according to a respective protocol and per packet processing action according to a respective individual routing table of the ~~respective~~ second virtual router,

wherein each of the plurality of virtual routers functions as the first virtual router to distribute a received packet to the second virtual router which exclusively executes the second packet processing action on the received packet, and

the second virtual router exclusively executes the second packet processing action on the received packet based on one of the corresponding relationships including one physical interface identifier for identifying the physical interface having received the packet, one logical interface identifier for identifying the logical interface having received the packet, one kind of protocol category of the received packet, and then performs a routing processing with reference to the routing information and outputs the packet.

9. (Currently Amended) An access router according to claim 8, wherein the ~~interface table~~ corresponding relationships and the routing information ~~[[table]]~~ are stored in different memories.
10. (Previously Presented) An access router according to claim 8, wherein L2TP tunnel identifiers, PPP session identifiers or identifiers of Internet service providers connected through external communication lines are used as the logical interface identifiers.
11. (Previously Presented) An access router according to claim 8, wherein port numbers of the plurality of communication I/Fs are used as the physical interface identifiers.
12. (Previously Presented) An access router according to claim 8, wherein the processor executes an L2TP Access Concentrator (LAC) function of terminating a plurality of L2TP tunnels or an L2TP Access Concentrator (LAC) function of initiating a plurality of L2TP tunnels for the plurality of virtual routers accommodated therein.

13. (Previously Presented) An access router according to claim 12, wherein
the memory stores a sequence for generating L2TP tunnels and a sequence for terminating the L2TP tunnels corresponding to received packets, and
the processor reads and executes any of the sequences to realize the LAC function and LNS function.
14. (Previously Presented) An access router according to claim 12, further comprising a means for switching between the LAC function and the LNS function.
15. (Previously Presented) An access router according to claim 13, wherein the processor has a setting means for determining which of the sequences is to be read, and switches between the LAC function and the LNS function by the setting means.
16. (Currently Amended) An access router according to claim 8, further comprising:
a program memory storing a program, the program for analyzing contents of management control commands received by the communication I/Fs;
wherein the processor executes the management control commands to authorize, according to a contract, control command sources to change settings in the ~~interface tables~~ corresponding relationships corresponding to all the virtual routers.
17. (Currently Amended) An access router according to claim 16, wherein the processor executes the management control commands to authorize a particular control command source to change settings in the ~~interface table~~ corresponding relationships corresponding to a particular virtual router.
18. (Currently Amended) A business method implementing via a virtual access router, comprising:
providing the virtual access router including a plurality of communication I/Fs to connect to external communication lines; a processor which executes predetermined processing on packets transmitted and received through a user terminal and utilizes ~~an interface table~~ corresponding relationships to support each of a plurality of virtual routers accommodated therein to perform routing actions independently from other virtual routers; and a memory which stores the corresponding relationships each defining among a physical interface identifier for

identifying a physical interface, a logical interface identifier for identifying a logical interface, a kind of protocol of a received packet, a first virtual router identifier for identifying a first virtual router, a first packet processing action to be executed on the received packet by the first virtual router, a second virtual router identifier for identifying the second virtual router designated to exclusively execute a second packet processing action which is different from first packet processing action,
~~reference information used to execute predetermined packet processing actions on received packets; wherein the memory stores: the interface table holding, for each of interfaces, a relation among a physical interface identifier and at least one logical interface identifier of the received packet, an identifier representing a protocol supported by the logical interface, information specifying a packet processing action to be executed based upon the protocol, and a virtual router identifier, and a plurality of said logical interfaces are multiplexed to handle a plurality of protocols on the communication I/Fs respectively so as to transmit and receive packets to and from user terminals according to a respective protocol and per packet processing action; and a routing information table holding routing information to be processed by virtual routers corresponding to the virtual router identifiers, respectively; wherein the processor refers to the interface table and identifies an identifier of a virtual router that corresponds to a respective L2TP tunnel to process the received packets and reads from the routing information table routing information managed by the virtual router corresponding to the virtual router identifier and forwards the received packets from an receiving logical interface to another interface associated with a respective virtual router, and the processor processes a received packet according to a respective protocol and per packet processing action according to a respective individual routing table of the respective virtual router; a program memory storing a program, the program for analyzing contents of management control commands received by the communication I/Fs; wherein the processor executes the management control commands to authorize, according to a contract, control command sources to change settings in the interface tables~~ corresponding relationships corresponding to all the virtual routers;

by a communication carrier who owns or manages the virtual access routers, associating interfaces connecting to networks of other communication carriers with particular virtual routers, and transferring to the other communication carriers authorities to use management control commands corresponding to the virtual routers;

distributing by each of the plurality of virtual routers functioning as the first virtual router a received packet to the second virtual router which exclusively executes the second packet processing action on the received packet; and

exclusively executing by the second virtual router the second packet processing action on the received packet based on one of the corresponding relationships including one physical interface identifier for identifying the physical interface having received the packet, one logical interface identifier for identifying the logical interface having received the packet, one kind of protocol category of the received packet, and then performing a routing processing with reference to the routing information and outputs the packet.

19. (Cancelled)

20. (Currently Amended) A virtual access router according to claim 8, wherein in a case where the logical interface identifier is not directly related to the physical interface identifier,

the ~~interface table~~ corresponding relationships each includes an independent entry including the logical interface identifier but excluding any of the physical interface identifiers, and

a packet received by the communication I/F is subjected to a protocol processing by corresponding one of the virtual routers based on an entry including corresponding one of the physical interface identifiers of the ~~interface table~~ corresponding relationships and then subjected to a protocol processing by corresponding one of the virtual routers based on an entry including corresponding one of the virtual interface identifiers of the ~~interface table~~ corresponding relationships.

21. (New) An access router configured with an L2TP Network Server (LNS) function for terminating a plurality of L2TP tunnels and an L2TP Access Concentrator (LAC) function for forming the plurality of L2TP tunnels and a plurality of virtual routers, each of the plurality of virtual routers including at least one of a physical interface and a logical interface and means for distributing a packet received at the physical or logical interface to another one of the plurality of virtual routers, comprising:

a plurality of physical interfaces each of which transmits or receives packets to/from an external communication line; and

a memory which stores corresponding relationships each defining among a physical interface identifier for identifying a physical interface, a logical interface identifier for identifying a logical interface, a kind of protocol of a received packet, a first virtual router identifier for identifying a first virtual router, a first packet processing action to be executed on the received packet by the first virtual router, a second virtual router identifier for identifying the second virtual router designated to exclusively execute a second packet processing action which is different from first packet processing action, and also stores routing information for routing a packet, wherein

the logical interfaces are multiplexed on the physical interfaces,

each of the plurality of virtual routers functions as the first virtual router to distribute a received packet to the second virtual router which exclusively executes the second packet processing action on the received packet, and

the second virtual router exclusively executes the second packet processing action on the received packet based on one of the corresponding relationships including one physical interface identifier for identifying the physical interface having received the packet, one logical interface identifier for identifying the logical interface having received the packet, one kind of protocol category of the received packet, and then performs a routing processing with reference to the routing information and outputs the packet.

22. (New) An access router according to claim 21, wherein

the access router performs the L2TP LAC function,

the plurality of virtual routers includes a first virtual router which has a physical interface or a logical interface for transmitting/receiving the first packet via a PPP session with a user terminal, and a second virtual router which has a physical interface or a logical interface for transmitting/receiving the second packet and establishing an L2TP tunnel with the first virtual router thereby functioning as an L2TP LNS device, and

the first virtual router encapsulates the first packet received via the PPP session into the second packet and send the second packet via the L2TP tunnel to the

second virtual router as the first packet processing action, and distributes the second packet via the L2TP tunnel to the second virtual router.

23. (New) An access router according to claim 21, wherein

the access router performs the L2TP LAC function,

the plurality of virtual routers includes a first virtual router which has a physical interface or a logical interface for transmitting/receiving the first packet via a PPP session with a user terminal, and a second virtual router which has a physical interface or a logical interface for transmitting/receiving the second packet and establishing an L2TP tunnel with the first virtual router thereby functioning as an L2TP LNS device, and

the first virtual router distributes the first packet via the PPP session to the second virtual router, and the second virtual router encapsulates the first packets into the second packet and distributes the second packet via L2TP tunnel as the second packet processing action.

24. (New) An access router according to claim 21, wherein

the access router performs the L2TP LNS function,

the plurality of virtual routers includes a first virtual router which has a physical interface or a logical interface for transmitting/receiving the first packet and establishing an L2TP tunnel thereby functioning as an L2TP LAC device, and a second virtual router which has a physical interface or a logical interface for transmitting/receiving the second packet from a backbone network, the first packet is a IP packet, and

the first virtual router establishes the L2TP tunnel and distributes the first packet via the L2TP tunnel to the second virtual router, and the second virtual router terminates the L2TP tunnel and decapsulates content encapsulated in the second packet via a PPP session as the second packet processing action.

25. (New) An access router according to claim 21, wherein

the access router performs the L2TP LNS function,

the plurality of virtual routers includes a first virtual router which has a physical interface or a logical interface for transmitting/receiving the first packet and establishing an L2TP tunnel thereby functioning as an L2TP LAC device, and a

second virtual router which has a physical interface or a logical interface for transmitting/receiving the second packet from a backbone network, the first packet is a IP packet, and

the first virtual router establishes the L2TP tunnel, decapsulates content encapsulated in the first packet via a PPP session into the second packet, distributes the second packet to the second virtual router as the first packet processing action, and the second virtual router terminates the L2TP tunnel as the second packet processing action.

26. (New) An access router according to claim 21, wherein the memory stores therein a table which has a virtual router field for storing virtual router identifiers, a destination IP address field for storing destination IP addresses of received packets, an address mask field for storing address masks, a self-address field for storing identifiers each indicating whether a packet to be processed is a self-addressed packet or not, a next hop address field for storing addresses each of a device to which a packet is to be transferred next, a physical interface field for storing physical interface identifiers, and a logical interface field for storing logical interface identifiers.
27. (New) An access router according to claim 21, wherein by a control command received by one of the physical interfaces or the logical interfaces, a correspondence between the physical or logical interfaces and the virtual routers is changed, and the packet processing action and the virtual router to be distributed is changed in each of the virtual routers.